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PHENOLOGICAL OBSERVATIONS.

By R. H. Hooker, M.A., F.R.Met.Soc.

Observations of the dates of flowering of plants, of the appearance of insects, and of the arrival of migratory birds, have been collected for many years under the auspices of the Royal Meteorological Society. The aim in collecting such observations is to endeavour to form some idea of the effects upon the animal and vegetable kingdoms of variations in climatic conditions from year to year. To ascertain precisely the laws which govern the date of occurrence of events in the life-history of animals and plants is a matter of extreme difficulty, but an interesting, and often material, contribution towards this result can be obtained from a knowledge of the average dates, and of the limits between which such dates vary. As an example of the practical use to which observations of a similar character have been put, we may quote the recent work of Dr. Unstead, who utilized the dates of sowing and harvesting wheat in different localities: calculations based on these, in combination with data as to temperature, have enabled him to form an estimate of the probable northern limit of profitable wheat cultivation in Canada, and to indicate regions where any attempt at wheat growing is foredoomed to failure by reason of the climate.

The phenological records of the Royal Meteorological Society are, however, of a simpler character, and aim more directly at a knowledge of the effect of the weather upon the commonest plants, birds and insects, and at obtaining some measure of the lateness or earliness of the season. Their reports also include various particulars of cultivated crops, based largely upon the data collected in recent years by the Board of Agriculture and Fisheries, as to the epoch and duration of harvest and quality of the crop.

For many years such observations were collected and analysed by the Rev. T. A. Preston, of Marlborough. In those days the list of objects was a large one: 79 species of plants, 11 of insects, and 21 of birds. This total was far too many, as the number of observers familiar with all these species was very small. When, in 1891, Mr. Edward Mawley, the well-known authority on horticulture, and for many years Secretary of the Royal Meteorological Society, took over

the conduct of the work, the number of species of plants and birds was very materially reduced, the aim being to retain only the commonest, so as to admit of the co-operation of any country resident taking an interest in what is now termed "nature-study." Records are accordingly now received from observers of (*a*) the date of flowering of 13 plants—hazel, coltsfoot, wood-anemone, blackthorn, hedge-mustard, horse-chestnut, hawthorn, ox-eye, dog-rose, knapweed, harebell, greater bindweed and ivy; (*b*) observations relating to 5 birds—the date on which the song-thrush and cuckoo are first heard, first and last appearances of the swallow, first appearance of the nightingale and flycatcher; (*c*) first appearance of 5 insects—honey bee, wasp, small white, orange-tip and meadow-brown butterflies. It is obvious that such generally recognised phenomena are within the powers of any observant person living in the country.

With regard to the flowers, it is to be remarked that the first flowering of the *earliest* plant is *not* what is wanted. The aim is not to create "fresh records," but to learn something of the effect of the season upon the normal plant—on vegetation generally, in fact. Thus it is essential for observers to select a particular tree, situated in a position which is as nearly as possible average in respect of exposure, &c., and observe the date of opening of its first flower every year. Similarly, in the case of herbaceous plants, an average position should be selected, not one unduly favoured or the reverse in the matter of sunshine, &c.; and the first primroses, blue-bells, ox-eyes, &c., noted at the same spot year after year.

For twenty years, from 1891 to 1910, Mr. Mawley not only diligently analysed the returns received, but, by keeping in personal touch with the observers, fully maintained their numbers and efficiency. Now, however, he has found the claims of other work to be so pressing as to demand the whole of his leisure, and the Royal Meteorological Society have been obliged to find a successor. Two members of the Society have undertaken the preparation of the annual report, namely, Mr. J. E. Clark and the writer of the present article—the latter being responsible for the statistical tabulation involved. But the duty of collecting the reports now devolves directly upon the staff of the Society; and they are anxious not merely to secure a succession of observers to fill the places of those who fall out by death, ill-health, or removal, and thus to maintain the numbers, but also to increase them. The phenological observers have for many years past numbered about 100, and it is due very largely to Mr. Mawley that there has been no diminution in their ranks. It is clear, however, that the accuracy of the averages calculated from the observations increases with the number of the records, and it is felt that these should be very largely increased. So far as the means for the whole country are concerned, the results show that these are reliable, but it is only certain districts of the south of England that can be said to be fairly represented. More observers are very urgently wanted, especially in Scotland, the north of England, and Ireland, where indeed, recorders

THAMES VALLEY RAINFALL – NOVEMBER, 1912.

are so sparse that we cannot judge with any certainty whether their dates are typical of the district or of the immediate locality only.

The Royal Meteorological Society will accordingly welcome any new observers, particularly in the districts specified above; and the Assistant Secretary (70, Victoria Street, London, S.W.) will be glad to send schedules and instructions to anyone who is willing to assist the work by undertaking the very simple observations required. No one need be deterred by the fear of missing two or three plants while absent on holidays, &c.: the records of the remaining phenomena can always be utilized, and their value is not in the least impaired. Observers who note only insects, or only birds, or plants, would also be useful. The schedules contain a blank page for remarks; and data regarding objects other than those specified are always interesting. Most observers already utilize this space, and, with more records, it would probably be possible to form average dates for other phenomena, particularly the flowering of the lesser celandine, the first appearance of the sand-martin, swift, chiff-chaff, corncrake, and others.

THE WEATHER OF NOVEMBER.

By Fred. J. Brodie.

The weather of last month was of a very varied character, no well defined type of pressure distribution remaining in force for more than three or four days at a time. At the commencement, when the conditions were mainly anticyclonic, the wind was light and variable, and the temperature was rather low, with sharp night frosts in all districts. In the western parts of the kingdom the lowest readings were observed early on the 1st or 2nd, the sheltered thermometer falling below 25° in many places, and reaching 23° at Kilmarnock and 21° at Birr Castle; on the grass it sank to 15° at Blackpool and 21° at Newton Rigg, in Cumberland. Over the eastern and central parts of Great Britain the sharpest frosts occurred on the 3rd or 4th, the thermometer on the latter day falling to 22° at Balmoral. The extension of a shallow depression from the northward on the 4th and 5th was followed by a temporary renewal of anticyclonic conditions, and on the 7th and 8th, when a mild southerly or south-westerly breeze sprang up, the thermometer rose above the normal, shade readings of 60° and upwards being recorded in several parts of England and Ireland. On the 7th the thermometer touched 66° at Dublin (Trinity College) and 67° at Newcastle, Co. Wicklow. Between the 10th and 12th, the passage of a deep cyclonic disturbance from Iceland to Central Europe resulted in strong gales from between west and north, on all our coasts, the polar current being accompanied at many northern stations by showers of hail or sleet. Sharp ground frosts occurred in many places between the 12th and 14th, the exposed thermometer falling to 22° at West Linton and to 20° at Crathes and Newton Rigg. On the 15th and 16th, an

anticyclone extended temporarily over Western Europe from the Atlantic, the central portion of the system afterwards receding slowly southwards. With the latter change a light westerly breeze set in over the United Kingdom, and sharp night frosts were again experienced in many parts of Great Britain. Early on the 18th, the thermometer at Balmoral sank to 22° in the screen, and to 19° on the grass; the exposed thermometer falling on the same day to 18° at Crathes and to 17° at Newton Rigg.

After the 18th, large cyclonic systems began to spread down from the Icelandic region, and between the 22nd and 27th the weather gradually fell into a very rough and unsettled state. For some little time the barometric minima passed along in tracks lying well to the northward of the United Kingdom, and the gales experienced on our coasts were of no great severity. On the 26th, however, when the centre of an exceptionally deep depression travelled north-eastwards directly across the west and north of Scotland, a violent storm from S.W. and W. was experienced, while in the rear of the depression an almost equally severe gale from N.W. and N. prevailed in the north of Scotland. At Aberdeen the wind reached, in squalls, a velocity of 75 miles per hour, and at Pendennis Castle (Falmouth), a velocity of 83 miles. During the progress of the disturbance the barometer at Wick fell, at 8 p.m. on the 26th to the unusually low level of 27·93 in., the lowest point reached in these islands since March 15th, 1905, when the mercury at Malin Head sank to 27·91 in.

The disappearance of the great storm system over northern Europe wae followed by the passage across our southern districts of other depressions from the westward, and over the major part of England and Ireland the weather remained in a very unsettled state. Temperature now fell steadily, and at the end of the month a frost of great severity was experienced over the entire northern half of the Kingdom, the sheltered thermometer falling on the 29th and 30th to 10° or less in many places. At Cally, Gatehouse, the minimum reading on the early morning of the last day was as low as 7°; at Balmoral, Kilmarnock, Ruthwell and Newton Rigg, 6°, and at Scaleby 3°, while at West Linton the thermometer sank to within 1° of zero. Over England the shade minima were not, as a rule, much below 20°, but at Bellingham, Northumberland, the thermometer fell to 14°. Over the greater part of north Britain severe frost continued throughout the opening days of December, and in many places it was accompanied by heavy falls of snow.

In the north of Scotland, the very low readings observed at the end of November, resulted in a mean monthly temperature a trifle below the average, but over the United Kingdom generally, the mean was high for the time of year. The total amount of bright sunshine was nearly everywhere below the normal. In London (at Westminster) the aggregate of 15 hours showed a deficiency of as many as 12 hours, and was the smallest recorded in November since 1901, when the month produced a miserable total of less than 7¼ hours.

ROYAL METEOROLOGICAL SOCIETY.

THE opening Meeting of this Society for the session was held on Wednesday evening, November 20th, at the Surveyors' Institution, Great George Street, Westminster, Dr. H. N. Dickson, President, in in the Chair.

Dr. H. R. Mill read a paper on the "Unprecedented Rainfall in East Anglia on August 26th last." He based his discussion on the records of 265 rainfall-observers in the Eastern Counties, from which he constructed a series of maps showing the hour of commencement, and of cessation, of rain, and the total rainfall of the 24 hours in question. The rain commenced in London between 1 and 2 a.m. on August 26th, but the hour of commencement grew later towards the north-west, rain not beginning to fall in Lincolnshire until after 7 a.m. The intensity of the fall increased rapidly over the whole area, the maximum being reached in a fall of 4 inches in four hours, from 11 a.m. to 3 p.m., in the neighbourhood of Norwich. The rain afterwards diminished in intensity and gradually ceased, the hour of cessation being 6 p.m. round the outside of the area affected, from Orford Ness to Grantham, but later toward the centre, where, over nearly the whole of Norfolk and a large wedge of Suffolk, it did not cease until after midnight on the 26th, and at some places not until 4 or 5 a.m. on the 27th. In this central area the rain fell without intermission, for more than 20 hours, and at some points probably for 24. The distribution of the rain was somewhat remarkable. There were two foci of maximum fall, both in Norfolk, the northern central, south of Cromer, with more than 7·50 inches, the larger central, east of Norwich, culminating in about 20 square miles, with more than 8 inches of rain in the 24 hours. About 1940 square miles in Norfolk and Suffolk had more than 4 inches of rain, the most curious feature being a triangle of much lower rainfall running through the west of Norfolk south-eastward from the Wash. The area with more than 2 inches of rain was at least 5800 square miles. The general rainfall of each of the counties was calculated for this day, and also that for the various river basins, which are given on the following page.

Former flood rains in the same area were considered and shown to have been quite insignificant in comparison; and only two instances could be found, July, 1875, and November, 1878, when the rainfall of a whole month surpassed that of these 24 hours. The cause of the prolonged torrential downpour was not to be found in the physical geography of the district affected, but in the meteorological conditions, for the full elucidation of which the data were insufficient. Considering the unprecedented magnitude of the volume of rain precipitated, the floods, of which a series of photographs was shown, were remarkable rather for their moderation than for the destruction wrought.

	Area. sq. miles.	Mean Rainfall in.	Volume. sq. mi. x inches.	Million gallons.	Weight Tons.
Huntingdonshire	366	2·27	830	12,012	53,630,000
Cambridgeshire	859	2·66	2,288	33,134	147,920,000
Suffolk	1,489	3·66	5,442	78,805	351,810,000
Norfolk:	2,044	5·08	10,376	150,242	670,720,000
Total.....	4,758	3·98	18,936	274,193	1,224,080,009

	Area. sq. miles.	Mean Rainfall. in.	Volume. sq. mi. x inches.	Million gallons.	Weight Tons.
Yare watershed-above junction of Wensum.	443	5·68	2,517	36,450	162,720,000
Yare watershed-below junction of Wensum.	430	5·54	2,384	34,523	154,120,000
Bure watershed	321	6·84	2,195	31,779	141,870,000
Total Area of Discharge at Yarmouth	1,194	5·94	7·096	102,752	458,710,000

Mr. A. W. Preston gave an account of the severity of the weather from his own observations at Norwich during the period dealt with by Dr. Mill in the paper. The rain fell in a fine steady downpour, not like thunderstorm rain, but later on, when the wind backed to the north-west and increased to a gale, it resembled in effect a driving snowstorm, and reminded him in many ways of the heavy snowstorm of January 18th, 1881. Some of the houses facing the wind were thoroughly washed and scoured as though with soap and water, and in many instances the mortar was removed.

Mr. G. L. Courthope, M.P., in a letter to the Secretary, said that at the sugar factory of the Anglo-Netherland Sugar Corporation, at Cantley, over 8 inches fell during the 29 hours of rain, and although there was no hail every particle of glass in the factory was broken, and the skylights were chipped out close to the frames, as if they had been carefully destroyed with a hammer.

Mr. A. P. Jenkin read a paper on "A 3-year Period in Rainfall." He first called attention to the subject in *Symons's Meteorological Magazine*, vol. **39** (1904), p. 81, and vol. **40** (1905), p. 179, and in this paper he has brought the information more up-to-date, and has included a number of records of rainfall from stations in various parts of Europe. He finds that in most of these there is a well marked 3-year period, but in many of them, during the later years, there is a distinct reversal.

Mr. C. Salter, Mr. W. W. Bryant, Mr. R. Strachan, Mr. W. B. Tripp and Mr. R. Inwards took part in the discussion.

The following new Fellows were elected:—Mr. H. B. Adames, Capt. F. Archer, Mr. F. E. Beavan, Mr. J. R. Brunton, Mr. L. Carpenter, Capt. B. L. Coats, Mr. F. Fairley, Rev. E. Frith, Mr. J. W. Gordon, B.Sc., Mr. P. de Jersey-Grut, Mr. J. J. P. Langton, Mr. L. Morgan, B.A., Mr. H. G. Robins, F.R.G.S., Mr. S. F. Simms, Mr. C. M. Stewart, Mr. H. E. I. Taylor and Mr. F. J. W. Whipple, M.A.

Correspondence.

To the Editor of Symons's Meteorological Magazine.

THE STORM OF AUGUST 26th, 1912.

THE magnitude of the great rain storm of August 26th, 1912, in East Anglia was so great that the imagination loses itself in the contemplation of the vast numbers required to express the volume and weight of the water which fell. It may possibly help readers to form some idea of the meaning of these numbers if they are stated in a slightly different form. Thus, if we consider, for convenience, the area of 5,862 square miles over which more than 2·00 in. of rain fell, and suppose that the whole of the precipitation, viz., 1,392,120,000 tons, which came down in the 24 hours of Black Monday could have been stored for purposes of water supply, we find that, allowing the unusually liberal quantity of 30 gallons per head per day, the volume of water would have been sufficient for the requirements of the whole population of Great Britain for a period of more than seven months. Another simple calculation shows that the whole population of the globe could have been supplied for about one week with the 200 gallons per head which would have fallen to the share of each person from the rain of that one day. It must be remembered that the area upon which these amounts of water fell forms less than one-twentieth part of the area of the British Isles and only $\frac{1}{83500}$ of the area of the globe.

CARLE SALTER.

SOME METEOROLOGICAL QUERIES.

I SHALL be much obliged if any of the readers of this Magazine would give me their views as to the following matters, on which I should like to arrive at definite opinions.

1. What is the standard for what we call a "shower"? We call a heavy rain of ·10 in. falling in 10 minutes a "shower," but ·10 in. falling in 100 minutes—a medium rate—a long shower, or a "rather wetday," and ·10 in. falling in drizzle of say ·01 in. an hour would be called a "damp and miserable wet day"—all of sufficient intensity to open an umbrella. We have a standard for a Rain Spell and a Rain Day, but as far as I know none for a "shower."

2. As the height of the mist line or the saturation point varies considerably on a mountain, is there a greater tendency—on the average—for it to appear at the line of the freezing point? My experience is that it does. If so—Why? And is mist occurring above the freezing line more opaque to light and denser than below?

3. Suppose that moisture is carried up a mountain slope of 1 in 5 to a height of 1000, 2000, 3000, 4000 or 5000 feet, at the rate of

20 miles an hour, the humidity of the same being 100 per cent., and temperature 60° at the sea level, what percentage of the moisture would be condensed at the varied heights, or amount of rain deposited per hour on the sheltered side of the hill assuming that all the condensed vapour would fall vertically into the rain gauge, and would the amount differ if the wind rate was 10 miles an hour?

J. R. G. J.

WATER SPOUTS OR CLOUD FORMS?

I SHALL be grateful if you or one of your contributors will enlighten me as to the nature of the remarkable cloud phenomenon described below. My impression was that I was witnessing a waterspout, but on referring to the *Encyclopedia Britannica* I find this described as "a vorticular storm occurring over a *water surface*, and in origin and form similar to a tornado over the land." I presume, however, the phenomenon was at least analogous.

On Sunday afternoon, August 24th, I was motoring with some friends from Sheffield to Buxton and about 1.25 p.m., as we were descending the hill from the head of the Winnats towards Buxton, about 1000 feet above sea level, we were delayed through a slight defect. While walking slowly on we saw a well-defined finger-shaped projection from the edge of a heavy rain-cloud right in front of us, that is towards the south-west. This projection quickly lengthened, at first tapering to a sharp point, then, after further lengthening, the end bending sharply downwards in a thin wavy "tail." In this form the main body of the object made an angle of about 40 degrees with the horizon, while the tail was about vertical, and did not appear to reach the ground. As soon as it had reached its complete form the object began to disintegrate. The outside, at first as sharply defined as the edge of a cumulus cloud, became "fuzzy," while at the same time an inner tube could be clearly made out. The whole then soon dissolved, and in little more than five minutes nothing was left but the heavy rain-cloud from which it had issued.

Wirksworth, Derby, 6th September, 1912. THOMAS GIBBS.

[In connection with the foregoing letter we may quote the description of undoubted waterspouts, observed from Seaforth Sands and West Kirby, between the estuaries of the Mersey and the Dee. The West Kirby observer, whose experience was communicated to us by Mr. J. F. Leigh Clare, of Heathfield, was wakened "one morning with a terrific peal of thunder at five o'clock," and on looking out saw "a great black cloud right over the sea with a long drooping tail to it." The Seaforth observer was standing at the local railway station on the morning of August 13th, and though Mr. Clare considers that both descriptions refer to the same phenomenon we think that if it had been at 5 a.m. the traveller would have mentioned the fact of his being astir at so unusual an hour.

The description of the phenomenon seen at Seaforth Sands is thus given in the *Liverpool Echo*, an evening paper of August 13th, 1912. We do not think it necessary to share the observer's belief that water poured from the spout into the sea.

A resident of Hoylake, who occupies a prominent position in the Bank of Liverpool, was an eye-witness this morning of an uncommon phenomenon in this district—a water spout—of which he gives an interesting and minute description.

"I was standing," he says, "on the platform of the Overhead Railway at Seaforth Sands this morning when, looking towards West Kirby, I observed a singular object in the sky. It seemed at first like a long heavy tail or spout descending from a mass of dark clouds. My attention was rivetted to the object, and I watched eagerly its developments.

"It quickly assumed the form of a water spout, in the shape in which these phenomena are commonly pictorially depicted. The root, so to speak, of the spout was very heavy and dropping, and as the point reached down towards the sea it tapered off somewhat at the side and bent in one direction, evidently owing to the pressure of the wind current then prevailing. As I scanned it, the mouth or outlet of the spout came into sudden contact with the sea, and immediately there ensued a great splashing.

"The sea seemed to dance at the point where the spout struck, the water rising around it, much after the manner in which a submarine explosion makes itself visible. The water from above continued to pour into the sea in great volume, and, quite emptying itself, the spout disappeared with the suddenness which characterised its advent."

"Rain was falling beneath the high and dark bank of cloud, but there was light enough along a large patch of the horizon beneath to show off the length and breadth and general features of the spout, which disappeared entirely after only about five minutes' duration."

INTERNATIONAL BALLOON ASCENTS.

By W. H. Dines, F.R.S.

May 18th, 1910. 7 a.m.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Pyrton Hill....	England	6·4	—60	10·9	—47	55	N.W.byW.
Petersfield	„	6·3	—62	11·8	—49	45	N.W.
Brussels	Belgium	7·6	—79	12·6	—63	49	N. by W.
Puy de Dome..	France	6·6	—72	6·8	—69	?	?
Hamburg.....	Germany....	7·0	—81	11·9	—70	17	E.N.E.
Lindenberg ...	„	7·0	—82	11·5	—60	36	E.S.E.
Strassburg	„	7·4	—83	11·1	—54	56	N. by E.
Munich	„	7·6	—80	?	?	22	N.E.

May 18th, 1910. 9.30 p.m.

Starting Point.	Country.	A miles.	B ° F.	C miles.	D ° F.	E miles.	F
Manchester....	England	6·9	—71	10·0	—71	64	N.
Pyrton Hill....	„	6·4	—71	9·4	—62	50	N. by W.
Petersfield	„	6·3	—74	8·7	—62	63	N. by W.
Lindenberg ..	Germany ..	8·1	—87	9·7	—65	26	E.
Ekaterinberg ..	„ ..	5·1	—54	9·6	—52	149	E.

May 19th, 1910. 2.30 a.m.

Manchester....	England	6·3	—77	7·8	—67	61	N. by W.
Pyrton Hill....	„	6·7	—72	8·8	—65	350	N.N.W.
Petersfield	„	6·3	—80	10·1	—67	42	N.W.
Brussels	Belgium	7·1	—78	10·0	—65	64	N. by W.
Paris.....	France	6·3	—60	8·3	—56	106	N. by E.
Lindenberg....	Germany ..	7·9	—85	10·8	—67	19	E.
Strassburg	„	7·5	—92	7·9	—78	72	N.E. by N.
Munich.....	„	7·6	—89	8·8	—72	34	N.E. by E.
Vienna.....	Austria	7·7	—85	11·1	—62	17	E.
Pavia.....	Italy.....	7·3	—94	7·4	—94	54	N. by E.
Pavlovsk	Russia	6·0	—64	9·9	—56	77	S.E. by S.

May 19th, 1910. 7 a.m.

Pyrton Hill....	England	6·8	—63	10·7	—49	50	N.N.W.
Brussels	Belgium	6·9	—85	8·8	—67	59	N.N.E.
Paris.....	France	7·1	—74	7·9	?	114	N.
Hamburg.....	Germany....			9·3	—67	19	N.
Lindenberg....	„	7·3	—80	8·8	—82	11	E.N.E.
Strassburg	„	7·5	—84	9·8	—64	29	N. by E.
Munich.....	„	7·7	—86	8·4	—74	22	N.E.
Zurich	Switzerland..	7·3	—88	12·5	—61	28	N.
Vienna.....	Austria	7·5	—86	11·4	—56	17	E.
Pavia.....	Italy.....	7·9	—89	10·0	—71	33	N. by E.
Omsk.....	Russia	6·8	—71	10·0	—51	115	E. by N.
Ekaterinberg ..	„	6·0	—56	10·8	—54	78	E.

May 19th, 1910. About 8 p.m.

Manchester....	England	6·9	—80	9·4	—69	113	N. by W.
Pyrton Hill....	„	7·3	—80	10·6	—65	97	N. by W.
Petersfield	„	6·9	—80	9·5	—69	119	N.N.W.

May 20th, 1910. 7 a.m.

Pyrton Hill....	England	7·4	—65	10·6	—49	125	N.W.
Brussels	Belgium	8·2	—89	9·3	—68	39	N.W.
Zurich	Switzerland..	7·6	—83	?		33	W.N.W.
Strassburg	Germany....	7·7	—84	9·7	—65	49	N.W.
Pavia	Italy.....	7·7	—85	8·6	—83	32	N.W. by W.
Pavlovsk	Russia	6·1	—63	7·9	—50	72	S.E. by E.

A Height in miles of commencement of isothermal column.
B Temperature, F°., at bottom of column.
C Greatest height of reliable record in miles.
D Temperature, F°., at greatest height.
E Distance in miles of point where balloon fell.
F Bearing of falling point from starting point.

These ascents were made on the occasion of the passage of the Earth through the tail of Halley's comet, which is supposed to have occurred during the night of the 18th of May. It was not expected that the results would show any unusual characteristics, neither do they do so. The most noticeable point is the prevalence of an air current from between south and east, whereas the usual drift of a balloon reaching a height of 10 miles is towards the south-east.

The pressure distribution was irregular and many thunderstorms occurred in west and mid-Europe. A cyclone moved northwards from the Bay of Biscay, another shallow depression moved westwards from the Adriatic, and an anticyclone over Scandinavia was increasing in strength. The times shown at the headings are approximate only.

REVIEWS.

Tripolitania e Cirenaica. Climatologia di Tripoli e Bengasi. Studio eseguito nel R. Ufficio Central di Meteorologia e Geodinamica per cura di. [Tripoli and the Cyrenaica. Climatology of Tripoli and Bengazi. Study carried out at the Royal Central Office for Meteorology and Geodynamics by] Filippo Eredia. Rome. 1912. Size $9\frac{1}{2} \times 6\frac{1}{2}$. Pp. 82.

This is one of the Colonial Monographs issued by the Italian Foreign Office, and in a preface Professor Luigi Palazzo, the Director of the Italian Meteorological Office, explains that the glorious event of the Italian occupation of the Turkish African provinces had caused many enquiries to be made as to the climate of the newly conquered territory. Meterological observations had been taken since 1892 at the Italian School in Tripoli, and from 1886, with some gaps, to 1905 in Bengazi. These observations are set out in monthly means, or totals, for each element of climate for the two stations and summed up in a comparison with the conditions at various towns in southern Italy. In July and August the mean monthly temperature of Tripoli and Bengazi is less than 2° F. above that of the southern Italian towns; but in the winter months there is a much greater difference, the annual range being considerably less on the African than on the Italian side of the Mediterranean. The rainfall is very much less at the African stations, where the months June to August are rainless, and December and January between them account for more than half the annual fall which is 16·80 in. at Tripoli and 11·00 in. at Bengazi, compared with 30·00 in. at Palermo.

Cinquanta anni di Storia Italiana (1860—1910) Pubblicazione fatta sotto gli auspicii del Governo e della R. Accademia del Lincei. [Fifty years of Italian History, 1860—1910; published under the anspices of the Government and of the Royal Academy of the Lincei.] LIUGI PALAZZO, *Meteorologia e Geodinamica.* Roma. 1911. Size 11 × 8. Pp. 56.

ON the occasion of the Jubilee of the kingdom of Italy the progress made in the various departments of public life was reported on by the authorities best informed on the subject, and Professor Palazzo here gives a concise history of the development of meteorology in Italy before and after the establishment of the national Meteorological Office in 1870.

Föhnuntersuchungen im Ballon von [Investigation of the Föhn by means of a balloon by] DR. H. v. FICKER. From *Sitzungsbericht* k Akad. Wiss. in Wien. Math—Naturwiss. Klasse. Bd. cxxi. Abt. 2a Mai, 1912. Size 10 × 6½. Pp. 46.

DR. VON FICKER has succeeded in supplementing his admirable studies of the Föhn wind by making two successful ascents in a balloon from Innsbruck while the Föhn was beginning to assert itself in the valley, and one when it was dying away. Several attempts were made to ascend during the full development of the Föhn, but it was found impossible to do so on account of the vehemence of the wind and the violent vertical currents which prevailed. Some data were, however, obtained from the free balloons sent up at intervals from Munich. The results are summarised as follows. Before the Föhn current reaches the bottom of the Inn valley or the northern plain it is flowing above the colder air masses which fill the valley and cover the plain to the same height, the disturbance layer (*Störungsschichte*), the upper boundary of which is often made visible by a sheet of cumulo-stratus. Before the outbreak of the Föhn the disturbance layer usually streams away to the north-west, becomes shallower and draws the air out of the mountain valleys, the direction of this wind being determined by the valleys, while that of the Föhn, even below the mountain crests, is not markedly influenced by the valleys. The Föhn blowing across the mountains descends the lee side into the valley, ascends on the weather side and descends again on the lee slopes into the plain, partially dissolving the clouds of the disturbance layer. The origin of these clouds is not due to the cooling by enforced ascents of previously warm air; but is due to changes in the intruding mass of cold air itself. The adiabatic gradient of descending air is not found in the free atmosphere, but only by comparison of observations undertaken in such positions as the ascending and descending currents on the valley sides.

Die täglichen Aenderungen der Windstärke auf dem Gipfel des Ben Nevis (und des Tsukubasan im Anhrang) von [The daily changes in wind-force on the summit of Ben Nevis (and on Tsukubasan, in an appendix) by] J. v. HANN. Wien, 1912. Aus den Sitzungsberichten k. Akad. Wiss. Math.-naturw. Kl. Bd. cxxxi. II.a. Februar, 1912. Size $10 \times 6\frac{1}{2}$, pp. 36.

THIS study of the daily variation of wind-force on Ben Nevis is the result of a request to Dr. Hann by the Royal Meteorological Society for a review of the five volumes of *Transactions* of the Royal Society of Edinburgh containing the observations made at the Ben Nevis Observatory. The opportunity was taken to go much more closely into the observations of wind-force, and the daily period of the wind-force and of the frequency of storms is worked out in detail. The regularity of the changes at all seasons is surprising, considering the high latitude and great cloudiness of the station.

Ergebnisse aus Dr. G. Glaser's meteorologischen Beobachtungen in San'â (el-Jeman) von [Results of Dr. E. Glaser's meteorological observations in Sana, Yemen, by] J. v. HANN. Aus den Sitzungsberichten k. Akad. Wiss., Math.-naturw. Kl. Bd. cxx. Abt. II.a. Dezember, 1911. Wien, 1912. Size, $10 \times 6\frac{1}{2}$, pp. 64.

THIS is surely the crowning work of Dr. Hann's genius, for the 64 closely printed pages of this memoir are occupied with the record and discussion of observations made at Sana, in southern Arabia, for the period extending from January 20th to October 15th, 1883, only 269 days altogether. Dr. Glaser's meteorological journal for this period consisted of 92 closely written octavo pages. The observations of pressure (by Aneroid), temperature (wet and dry bulb), and wind, were made at 7 a.m., 2 p.m. and 9 p.m. daily, and on 17 special days observations were made hourly from 7 a.m. on one day to 6 a.m. on the next. Such strenuous work undoubtedly merited the full discussion it has received.

Report of the Ninth Meeting of the International Meteorological Committee, and of the Sixth Meeting of the Commission for Terrestrial Magnetism and Atmospheric Electricity. Berlin, 1910. Published by Authority of the Meteorological Committee. London, H.M. Stationery Office, 1912. Size, $9\frac{1}{2} \times 6$, pp. 144. Price 3s.

THIS Report resembles the lady's letter of the ancient joke, in that its most important part is the postscript or series of appendices. Of these perhaps the most interesting is No. IVa, the list of stations compiled for the Solar Commission, with meteorological data for January, 1905. The list of stations differs from ordinary lists by

being extremely systematic, the aim being to give two stations for each "ten-degree square" (we use the quaintly unscientific phrase employed in the report to designate a figure which varies from something nearly a square to something like an acute angled triangle, according to its position on the surface of the land of the globe). Under the charge of Mr. Lempfert this list has been utilized to give for the first time a conspectus of the meteorological conditions of the whole of the land of the globe for a given month, the data being pressure, mean and absolute maximum temperatures, mean and absolute minimum temperatures, and rainfall, all in the units (millimetres, inches, degrees centigrade or Fahrenheit) in which the observations were taken. Other appendices deal with *Réseau Mondial*, which is not translated and will puzzle some readers. It would surely not be impossible to devise an English phrase for a network of stations representing the whole globe. Amongst the other interesting matters dealt with in the thirty appendices are many proposals for improving meteorological observations (we note the very important question of the uniform treatment of snow), and it is abundantly evident that the International Committee is a live body, keenly set on advancing the science of meteorology as well as the art of weather forecasting.

Regenkarten der Provinz Schlesien mit erlauternden Text und Tabellen (Ditto, *Provinzen Westpreussen und Posen*) *von.* [Map of the Province of Silesia, with explanatory text and tables (Ditto for the Provinces of West Prussia and Posen) by] G. Hellmann. Berlin, 1912. Dietrich Reimer (Ernst Vohsen). Size 11 × 7½. Pp. 26. Price 2 marks each.

Although described merely as second and enlarged editions, these memoirs are entirely new, being based on the 20 years' observations in Silesia, 1888-1907, and in West Prussia and Posen, 1890-1909, for which the full system of rain gauge records were available at the time of compilation. The 20 year means are given for each station, and an annual rainfall map compiled from them for each Province. In addition, a map of the mean rainfall of each month for the 20 years is given on a smaller scale. The stations at which a similar distribution of monthly rainfall prevailed were grouped together, and by taking account of minor differences twelve of these groups were obtained, the areas occupied by the stations forming each group varying widely. The mean monthly rainfall of each group is plotted in a series of curves, which show an extremely well-marked annual period with a winter minimum and summer maximum. Over the greater part of Silesia the maximum occurred in July and the minimum in February, thuogh in some of the groups in the south-east the rainfall of June and August nearly equals that of July; and

in some of the groups of West Prussia and Posen the maximum is shifted to August. There is a slight indication on some of the curves of a check, and sometimes a slight increase of rainfall in October; but no hint of the great maximum in that month which dominates the rainfall curve in England as a transition towards the winter maximum and summer minimum of the Atlantic borders of Ireland and Scotland. The north-east German rain curves are, in fact, almost the inverse of the rain curves of the Atlantic coasts of the British Isles.

While the chief value of the new work lies in the mapping of the mean rainfall for 20 years (a period, by the way, that would be quite inadequate for mapping the mean rainfall of the British Isles), there are interesting tables of heavy falls of rain in short periods, of the extremes of monthly rainfall, and of the frequency of rain. The whole work bears the impress of the author in the clear statement of the facts dealt with, the ample size of the page, and the quality of the typography and cartography.

Der Einfluss geringer Geländeverschiedenheiten auf de meteorologischen Elemente im norddeutschen Flachlande, von [The influence of small differences in the configuration of the land on the meteorological elements in the North German Plain, by] K. KNOCH. No. 3, vol. 4 of the publications of the Royal Prussian Meteorological Institute. Berlin, 1911. Behrend & Co. Size $13\frac{1}{2} \times 10\frac{1}{2}$. Pp. 54.

THIS research deals with a small part of a very important problem. It deals with observations of temperature and precipitation at several stations differing in their geographical surroundings; but the absence of either map or views makes it somewhat difficult to follow. At the Potsdam Observatory there are two stations, one on a tower of the Observatory building about 100 feet above the ground, the other in a clearing in the wood which completely covers the hilly ridge rising to the height of about 160 feet above the plain of the Havel. There was also a station in the flat valley of the Nuthe about a mile from the Observatory, and two others more distant. The final result of the comparison was that the station in the clearing gave a fair representation of the mean conditions in the North German Plain; but that individual elements, and especially the duirnal and annual range, exhibit the peculiarities of a station surrounded by forest, and that these are so marked in some cases as to conceal the influence of the more elevated position.

RAINFALL TABLE FOR NOVEMBER 1912.

STATION.	COUNTY.	Lat. N.	Long. W. [*E.]	Height above Sea. ft.	RAINFALL OF MONTH. Aver. 1875—1909. in.	1912. in.
		° ′	° ′			
Camden Square	*London*	51 32	0 8	111	2·34	1·59
Tenterden	*Kent*	51 4	*0 41	190	3·07	2·63
Arundel (Patching)	*Sussex*	50 51	0 27	130	3·54	2·02
Fawley (Cadland)	*Hampshire*	50 50	1 22	52	3·39	...
Oxford (Magdalen College)	*Oxfordshire*	51 45	1 15	186	2·25	1·66
Wellingborough (Croyland Abbey)	*Northampton*	52 18	0 41	174	2·23	1·80
Shoeburyness	*Essex*	51 31	*0 48	13	2·09	1·54
Bury St. Edmunds (Westley)	*Suffolk*	52 15	*0 40	226	2·40	2·44
Geldeston [Beccles]	*Norfolk*	52 27	*1 31	38	2·49	3·04
Polapit Tamar [Launceston]	*Devon*	50 40	4 22	315	4·07	3·82
Rousdon [Lyme Regis]	,,	50 41	3 0	516	3·51	1·31
Stroud (Upfield)	*Gloucestershire*	51 44	2 13	226	2·77	1·70
Church Stretton (Wolstaston)	*Shropshire*	52 35	2 48	800	2·94	2·69
Coventry (Kingswood)	*Warwickshire*	52 24	1 30	340	2·61	1·64
Boston	*Lincolnshire*	52 58	0 1	25	2·05	2·37
Worksop (Hodsock Priory)	*Nottinghamshire*	53 22	1 5	56	1·98	2·41
Macclesfield	*Cheshire*	53 15	2 7	501	3·00	2·71
Southport (Hesketh Park)	*Lancashire*	53 38	2 59	38	3·16	2·48
Arncliffe Vicarage	*Yorkshire, W.R.*	54 8	2 6	732	6·12	5·98
Wetherby (Ribston Hall)	,, ,,	53 59	1 24	130	2·34	2·23
Hull (Pearson Park)	,, *E.R.*	53 45	0 20	6	2·34	3·18
Newcastle (Town Moor)	*Northumberland*	54 59	1 38	201	2·63	1·62
Borrowdale (Seathwaite)	*Cumberland*	54 30	3 10	423	13·59	15·64
Cardiff (Ely)	*Glamorgan*	51 29	3 13	53	4·08	3·41
Haverfordwest	*Pembroke*	51 48	4 58	95	5·16	5·41
Aberystwyth (Gogerddan)	*Cardigan*	52 26	4 1	83	4·50	5·61
Llandudno	*Carnarvon*	53 20	3 50	72	3·19	3·01
Cargen [Dumfries]	*Kirkcudbright*	55 2	3 37	80	4·35	3·96
Marchmont House	*Berwick*	55 44	2 24	498	3·21	1·90
Girvan (Pinmore)	*Ayr*	55 10	4 49	207	5·24	5·20
Glasgow (Queen's Park)	*Renfrew*	55 53	4 18	144	3·63	3·85
Inveraray (Newtown)	*Argyll*	56 14	5 4	17	7·39	9·77
Mull (Quinish)	,,	56 34	6 13	35	6·24	4·62
Dundee (Eastern Necropolis)	*Forfar*	56 28	2 57	199	2·62	1·91
Braemar	*Aberdeen*	57 0	3 24	1114	3·76	3·97
Aberdeen (Cranford)	,,	57 8	2 7	120	3·29	3·20
Cawdor	*Nairn*	57 31	3 57	250	2·60	2·89
Fort Augustus (S. Benedict's)	*E. Inverness*	57 9	4 41	68	4·51	6·23
Loch Torridon (Bendamph)	*W. Ross*	57 32	5 32	20	8·90	13·70
Dunrobin Castle	*Sutherland*	57 59	3 56	14	3·25	4·35
Wick	*Caithness*	58 26	3 6	77	2·95	4·20
Killarney (District Asylum)	*Kerry*	52 4	9 31	178	5·54	...
Waterford (Brook Lodge)	*Waterford*	52 15	7 7	104	3·80	1·83
Nenagh (Castle Lough)	*Tipperary*	52 54	8 24	120	3·88	2·83
Miltown Malbay	*Clare*	52 52	9 26	400	4·50	...
Gorey (Courtown House)	*Wexford*	52 40	6 13	80	3·41	1·78
Abbey Leix (Blandsfort)	*Queen's County*	52 56	7 17	532	3·28	2·00
Dublin (Fitz William Square)	*Dublin*	53 21	6 14	54	2·64	1·44
Mullingar (Belvedere)	*Westmeath*	53 29	7 22	367	3·38	2·97
Cong (The Glebe)	*Mayo*	53 33	9 16	112	5·00	5·59
Crossmolina (Enniscoe)	*Mayo*	54 4	9 16	74	5·75	6·07
Collooney (Markree Obsy.)	*Sligo*	54 11	8 27	127	4·02	4·97
Seaforde	*Down*	54 19	5 50	180	3·86	2·20
Bushmills (Dundarave)	*Antrim*	55 12	6 30	162	3·77	4·75
Omagh (Edenfel)	*Tyrone*	54 36	7 18	280	3·66	4·96

RAINFALL TABLE FOR NOVEMBER, 1912—*continued.*

RAINFALL OF MONTH (*con.*)					RAINFALL FROM JAN. 1.					
Diff. from Av. in.	% of Av.	Max. in 24 hours. in.	Max. in 24 hours. Date.	No. of Days	Aver. 1875–1909. in.	1912. in.	Diff. from Aver. in.	% of Av.	Mean Annual 1875–1909. in.	STATION.
— ·75	68	·32	26, 28	16	22·98	25·07	+2·09	109	25·11	Camden Square
— ·44	86	·62	26	17	24·87	29·92	+5·05	120	27·64	Tenterden
—1·52	57	·45	26	14	27·57	35·10	+7·53	127	30·48	Patching
...	...	...	...	...	28·64	...	...	...	31·87	Cadland
— ·59	74	·40	28	12	22·52	27·72	+5·20	123	24·58	Oxford
— ·43	81	·37	26	16	23·04	27·60	+4·56	120	25·17	Croyland Abbey
— ·55	74	·26	26	15	17·57	18·38	+ ·81	105	19·28	Shoeburyness
+ ·04	102	·47	12	16	23·26	28·69	+5·43	123	25·40	Westley
+ ·55	122	·62	12	21	21·66	27·32	+5·66	126	23·73	Geldeston
— ·25	94	·75	28	19	33·81	43·81	+10·00	130	38·27	Polapit Tamar
—2·20	37	·34	26	9	29·86	36·21	+6·35	121	33·54	Rousdon
—1·07	61	·36	11	15	27·10	39·47	+12·37	145	29·81	Stroud
— ·25	92	·37	10	15	29·42	34·95	+5·53	119	32·41	Wolstaston
— ·97	63	·26	4, 28	15	26·32	33·82	+7·50	128	28·98	Coventry
+ ·32	116	·37	4	17	21·47	27·85	+6·38	130	23·35	Boston
+ ·43	122	·86	28	14	22·29	31·02	+8·73	139	24·46	Hodsock Priory
— ·29	90	·55	4	16	31·38	33·42	+2·04	106	34·73	Macclesfield
— ·68	78	·53	4	20	29·60	34·30	+4·70	116	32·70	Southport
— ·14	98	1·12	4	16	54·74	61·31	+6·57	112	61·49	Arncliffe
— ·11	95	·38	14, 29	13	24·60	33·90	+9·36	138	26·87	Ribston Hall
+ ·84	136	·93	28	16	24·10	31·13	+7·03	129	26·42	Hull
—1·01	62	·43	12	19	25·48	30·26	+4·78	119	27·94	Newcastle
+2·05	115	3·73	4	20	114·34	119·73	+5·39	105	129·48	Seathwaite
— ·67	84	·81	26	19	37·58	48·61	+11·03	129	42·28	Cardiff
+ ·25	105	1·10	28	21	41·63	51·42	+9·79	124	46·81	Haverfordwest
+1·11	125	·88	28	23	40·80	49·63	+8·83	122	45·46	Gogerddan
— ·18	94	·61	25	20	27·52	30·12	+2·60	109	30·36	Llandudno
— ·39	91	·73	25	19	38·63	45·99	+7·36	119	43·47	Cargen
—1·31	59	·35	24	15	30·93	29·41	—1·52	95	33·76	Marchmont
— ·04	99	·65	24	24	44·29	46·30	+2·01	105	49·77	Girvan
+ ·22	106	1·31	24	13	32·02	30·92	—1·10	97	35·97	Glasgow
+2·38	132	1·88	24	23	60·10	62·31	+2·21	104	68·67	Inveraray
—1·62	74	·60	25	27	49·98	45·42	—4·56	91	56·57	Quinish
— ·71	73	·91	24	13	25·97	26·05	+ ·08	100	28·64	Dundee
+ ·21	105	...	...	...	31·80	33·67	+1·87	106	34·93	Braemar
— ·09	97	·60	30	17	29·30	31·65	+2·35	108	32·73	Aberdeen
+ ·29	111	·94	26	13	26·80	23·45	—3·35	88	29·33	Cawdor
+1·72	138	1·08	24	27	38·91	38·10	— ·81	98	44·53	Fort Augustus
+4·80	154	1·72	26	28	74·07	71·45	—2·62	96	83·93	Bendamph
+1·10	134	·70	26	21	28·81	29·98	+1·17	104	31·90	Dunrobin Castle
+1·25	142	·46	26	29	26·77	28·33	+1·56	106	29·88	Wick
...	...	...	...	...	47·89	...	...	...	54·81	Killarney
—1·97	48	·46	28	12	35·25	38·51	+3·26	109	39·57	Waterford
—1·05	73	·54	25	18	35·09	34·31	— ·78	98	39·43	Castle Lough
...	...	...	...	...	40·27	...	...	...	45·11	Miltown Malbay
—1·63	52	·44	25	15	31·57	39·57	+8·00	125	34·99	Courtown Ho.
—1·28	61	·44	4	17	32·51	33·34	+ ·83	103	35·92	Abbey Leix
—1·20	55	·37	24	14	25·41	25·78	+ ·37	101	27·68	Dublin
— ·41	88	1·05	4	21	32·76	36·67	+3·91	112	36·15	Mullingar
+ ·59	112	·99	4	22	43·48	40·07	—3·42	92	48·90	Cong
+ ·32	106	·87	7	23	46·76	...	...	...	52·87	Enniscoe
+ ·95	124	·85	8	21	38·37	42·39	+4·02	110	42·71	Markree
—1·66	57	·58	4	16	35·14	41·44	+6·30	118	38·91	Seaforde
+ ·98	126	·60	24	25	33·69	36·83	+3·14	109	37·56	Dundarave
+1·30	136	·75	4	22	35·47	41·55	+6·08	117	39·38	Omagh

SUPPLEMENTARY RAINFALL, NOVEMBER, 1912.

Div.	STATION.	Rain inches	Div.	STATION.	Rain inches.
II.	Warlingham, Redvers Road..	2·75	XI.	Lligwy	3·32
,,	Ramsgate	1.81	,,	Douglas	4·67
,,	Hailsham	2·12	XII.	Stoneykirk, Ardwell House...	3·32
,,	Totland Bay, Aston House...	2·67	,,	Dalry, The Old Garroch.....	5·52
,,	Stockbridge, Ashley..	1·97	,,	Langholm, Drove Road	3·99
,,	Grayshott	2·28	,,	Beattock, Kinnelhead	8·11
,,	Caversham, Rectory Road ...	1·81	XIII.	St. Mary's Loch, Cramilt Ldge	4·17
III.	Harrow Weald, Hill House...	1·97	,,	North Berwick Reservoir.....	1·41
,,	Pitsford, Sedgebrook.....	1·75	,,	Edinburgh, Royal Observaty.	1·62
,,	Woburn, Milton Bryant.....	1·82	XIV.	Maybole, Knockdon Farm ...	4·78
,,	Chatteris, The Priory.....	1·77	XV.	Campbeltown, Witchburn ..	5·16
IV.	Colchester, Lexden	1·93	,,	Holy Loch, Ardnadam.....	8·58
,,	Newport.....	2·15	,,	Ballachulish House	10·03
,,	Ipswich, Copdock	2·22	,,	Islay, Eallabus	4·90
,,	Blakeney.....	3·10	,,	Tiree, Cornaigmore	4·03
,,	Swaffham	2·81	XVI.	Dollar Academy	3·54
V.	Bishops Cannings	1·85	,,	Balquhidder, Stronvar.....	7·43
,,	Winterbourne Steepleton.....	2·27	,,	Coupar Angus	1·82
,,	Ashburton, Druid House.....	3·46	,,	Glenlyon, Meggernie Castle..	6·33
,,	Cullompton	1·48	,,	Blair Athol	4·07
,,	Lynmouth, Rock House	3·48	,,	Montrose, Sunnyside Asylum.	2·37
,,	Okehampton, Oaklands.....	3·78	XVII.	Alford, Lynturk Manse	...
,,	Hartland Abbey.....	2·77	,,	Fyvie Castle	3·69
,,	Probus, Lamellyn.....	3·11	,,	Keith Station	2·87
,,	North Cadbury Rectory.....	2·02	XVIII.	Skye, Dunvegan	9·00
VI.	Clifton, Pembroke Road.....	2·44	,,	N. Uist, Lochmaddy	7·26
,,	Ross, The Graig	1·29	,,	Glenquoich, Loan.....	26·10
,,	Shifnal, Hatton Grange.....	2·65	,,	Alvey Manse.....	3·65
,,	Droitwich.....	1·74	,,	Loch Ness, Drumnadrochit...	4·10
,,	Blockley, Upton Wold.....	1·93	,,	Glencarron Lodge	14·71
VII.	Market Overton.....	2·23	XIX.	Invershin	4·00
,,	Market Rasen.....	3·66	,,	Loch Stack, Ardchullin	10·50
,,	Bawtry, Hesley Hall	1·97	,,	Melvich	4·99
,,	Derby, Midland Railway.....	1·93	XX.	Skibbereen Rectory	3·64
,,	Buxton	4·03	,,	Dunmanway, The Rectory ..	4·86
VIII.	Nantwich, Dorfold Hall	3·16	,,	Glanmire, Lota Lodge.....	2·05
,,	Chatburn, Middlewood	4·75	,,	Mitchelstown Castle.....	3·43
,,	Cartmel, Flookburgh	5·75	,,	Darrynane Abbey.....	3·87
IX.	Langsett Moor, Up. Midhope	3·01	,,	Clonmel, Bruce Villa	2·01
,,	Scarborough, Scalby	3·07	,,	Newmarket-on-Fergus, Fenloe	2·63
,,	Ingleby Greenhow	3·19	XXI.	Laragh, Glendalough	3·99
,,	Mickleton	3·20	,,	Ballycumber, Moorock Lodge	2·47
X.	Bellingham, High Green Manor	3·05	,,	Balbriggan, Ardgillan	1·49
,,	Ilderton, Lilburn Cottage ...	1·94	XXII.	Woodlawn	3·40
,,	Keswick, The Bank.....	5·55	,,	Westport, St. Helens	4·74
XI.	Llanfrechfa Grange	3·16	,,	Achill Island, Dugort	8·52
,,	Treherbert, Tyn-y-waun	6·35	,,	Mohill, The Rectory	3·46
,,	Carmarthen, The Friary	4·66	XXIII.	Enniskillen, Portora.....	4·03
,,	Castle Malgwyn [Llechryd]...	4·45	,,	Dartrey [Cootehill]	2·90
,,	Crickhowell, Tal-y-maes.....	3·10	,,	Warrenpoint, Manor House ..	2·82
,,	New Radnor, Ednol	2·18	,,	Banbridge, Milltown	2·40
,,	Rhayader, Tyrmynydd	6·26	,,	Belfast, Cave Hill Road	3·05
,,	Lake Vyrnwy	...	,,	Glenarm Castle.....	4·00
,,	Llangyhanfal, Plâs Draw.....	3·24	,,	Londonderry, Creggan Res...	5·18
,,	Dolgelly, Bryntirion.....	7·55	,,	Killybegs	8·57
,,	Bettws-y-Coed, Tyn-y-bryn...	7·27	,,	Horn Head	5·46

METEOROLOGICAL NOTES ON NOVEMBER, 1912.

ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Temp. for Temperature; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; TS for Thunderstorm; R for Rain; H for Hail; S for Snow; F for number of days Frost in Screen; f on Grass.

LONDON, CAMDEN SQUARE.—Dull, gloomy weather with frequent though not heavy R continued throughout the month. Mean temp. 43°·7, or 0°·2 above the average. Duration of sunshine 23·8* hours, and of R 37·2 hours. Evaporation ·33 in. Shade max. 56°·3 on 9th; min. 27°·7 on 3rd. F 6, f 12.

TENTERDEN.—A dull month. Cold at beginning and end. Duration of sunshine 46·0† hours. Shade max. 55°·5 on 8th; min. 28°·0 on 28th. F 5, f 11.

TOTLAND BAY.—Duration of sunshine 48·1* hours, and the least sunny November in the record. The R on 28th, 1·01 in., fell in less than 3 hours. Shade max., 57°·8 on 7th; min., 33°·1 on 28th. F 0, f 15.

PITSFORD.—Mean temp. 42°·3. R ·67 in. below the average. Shade max. 58°·6 on 10th; min. 26°·7 on 30th. F 8.

IPSWICH, COPDOCK.—After a brilliant opening it turned mild about 4th and was dull with a good deal of R thenceforward. Duration of sunshine 54·9† hours. Mean temp. 42°·1. Shade max. 58°·0 on 8th; min. 25°·0 on 30th. F 5, f 12.

WINTERBOURNE STEEPLETON.—Shade max. 56°·8 on 9th; min. 25°·0 on 28th. F 7, f 14.

NORTH CADBURY.—S fell on the Mendip Hills on 27th and lay for 2 days. Shade max. 59°·0 on 7th; min. 28°·0 on 28th. F 4, f 13.

WOLSTASTON.—Heavy S on 29th, with severe frost. Mild from 16th to 23rd. Shade max. 59°·0 on 7th; min. 19°·0 on 30th. F 6.

HODSOCK PRIORY.—Less sunshine than in any previous November in the record. Shade max. 57°·7 on 7th; min. 19°·8 on 30th. F 7, f 18.

SOUTHPORT.—Duration of sunshine 48·2* hours, and of R 56·1 hours. Mean temp. 44°·5, or 1°·2 above the average. The grass min. temp., 7° on 30th, is believed to be unprecedented here in November. Shade max. 59°·0 on 7th; min. 22°·0 on 30th. F 4, f 11.

HULL.—The first few days were fine, then cloudy and dull with frequent R and mist. Stormy with R and H on 25th and 26th, then cold and winterly. S fell in night of 28th and morning of 29th, lying on the ground to the end of the month. Duration of sunshine 29·3* hours.

HAVERFORDWEST.—Duration of sunshine 33·8* hours. Shade max. 57°·8 on 13th; min. 27°·7 on 30th.

LLANGYHANFAL.—Dull, mild and rainy. Stormy on 26th and following days, with 4½ inches of S on 3th. Mean temp. 43°·9. Shade max. 60°·1 on 7th; min. 18°·9 on 30th. F 5, f 14.

CARGEN.—The sharpest frost experienced here in November since observations commenced occurred 29th–30th. On both days temp. never rose above 32°, and on 30th 26° of frost were registered. S 6 inches deep on 28th. Shade max. 58°·0 on 4th; min. 6°·0 on 30th. F 9.

EDINBURGH.—Shade max. 58°·4 on 7th; min. 21°·0 on 30th. F 4, f 9.

INVERARAY.—A gale on 26th with high tide flooded houses, &c.

DUNDEE.—Shade max. 55°·4 on 8th; min. 17°·5 on 29th. F 9.

LOCH STACK.—Duration of sunshine 7·2* hours.

DUNMANWAY.—Mild and dry up to 22nd, after which it was unsettled and cold. On morning of 27th 3 inches of S fell.

DUBLIN.—Alternate cold and warm spells, a moderate R and a great preponderance of W. winds. Mean temp., 45°·3, was exactly the average. Shade max. 64°·2 on 7th; min. 27°·0 on 30th. F 5, f 7.

MARKREE.—Duration of sunshine 22·7 hours. Shade max. 57°·0 on 7th and 26th; min. 18°·0 on 30th. F 6, f 7.

WARRENPOINT.—A month of frequent though not heavy R. A good deal of high winds, and towards the end severe frosts.

* Campbell-Stokes. † Jordan.

Climatological Table for the British Empire, June, 1912.

STATIONS. (*Those in italics are South of the Equator.*)	Absolute. Maximum. Temp.	Date.	Minimum. Temp.	Date.	Average. Max.	Min.	Dew Point.	Humidity.	Absolute. Max. in Sun.	Min. on Grass.	Total Rain. Depth.	Days.	Aver. Cloud.
	°		°		°	°	°	0-100	°	°	inches		
London, Camden Square	83·4	19	44·7	3	69·6	51·1	52·3	77	131·9	41·6	3·23	19	7·3
Malta	81·9	30	62·4	17	76·0	65·7	63·0	78	143·0	.	...	...	3·2
Lagos	89·5	7	69·0	18	84·9	74·1	73·6	80	152·0	67·5	11·74	21	5·4
Cape Town	86·3	2	39·8	21	67·4	53·4	51·5	77	...	...	2·38	9	4·3
Johannesburg	69·6	27	31·8	19	60·3	39·8	32·8	62	116·0	29·0	·04	1	1·7
Mauritius	77·8	1, 16	53·9	27	75·6	62·3	60·4	75	139·0	46·3	·90	14	4·9
Bloemfontein	67·1	28	25·5	9	59·1	32·9	31·0	74	...	...	·33	2	2·0
Calcutta...	100·3	17	73·0	9	92·8	79·2	77·7	80	...	70·8	9·53	11	6·4
Bombay...	95·3	11	75·4	29	89·9	81·0	77·8	79	134·0	74·5	10·79	15	6·1
Madras	108·2	2	74·9	20	101·2	83·2	74·7	66	147·6	74·9	1·78	4	4·1
Kodaikanal	73·5	2	51·2	5	65·4	54·1	52·4	80	145·9	45·4	3·76	20	7·9
Colombo, Ceylon ...	88·0	3	72·3	5	85·3	76·5	74·4	81	148·0	66·2	12·70	27	8·0
Hongkong	89·3	17	74·0	5	85·4	78·6	76·8	85	141·2	...	14·16	27	8·8
Sydney	64·7	1	42·9	20	61·1	48·3	45·3	76	108·3	31·9	2·68	26	4·1
Melbourne	65·7	5	32·1	22	57·3	44·3	44·1	77	98·7	29·9	1·27	18	6·9
Adelaide	67·0	5	38·2	19	60·6	47·1	46·6	78	129·4	29·0	3·80	15	6·5
Perth	74·9	2	42·3	26	64·8	49·8	48·0	70	125·1	30·4	4·06	11	5·8
Coolgardie	75·2	4	35·0	25	62·8	43·1	40·9	60	130·4	30·4	·27	4	1·9
Hobart, Tasmania ..	63·1	5	34·3	23	54·1	42·3	40·9	74	108·9	29·5	2·82	18	6·4
Wellington	58·0	6	36·0	25	53·7	43·9	38·5	68	95·0	29·0	6·33	22	7·7
Auckland	64·0	2	36·5	25	57·5	47·2	46·3	81	86·0	33·0	5·46	25	5·6
Jamaica, Kingston ..	92·0	30	72·1	19	89·8	75·2	71·2	74	...	...	·08	1	4·7
Grenada	86·0	4, 20	72·0	22	83·3	76·2	...	77	138·0	...	7·20	27	5·0
Toronto	88·7	29	37·0	8	73·2	51·2	...	...	139·4	31·2	1·75	10	3·8
Fredericton	90·0	25	35·0	8	70·0	46·3	...	70	...	...	7·57	12	5·0
St. John, N.B. ...	76·3	24	39·8	11	63·0	48·2	...	...	...	...	2·65	12	5·6
Edmonton, Alta. ...	89·7	21	32·7	4	74·3	50·2	...	59	138·0	23·5	3·72	15	3·3
Victoria, B.C.	85·9	6	41·2	3	68·7	49·5	...	68	...	...	·99	6	5·0
Dawson	79·0	30	31·0	28	64·7	41·0	...	...	...	...	·75	11	6·3

MALTA.—Mean temp. of air 70°·4. Average bright sunshine 10·4 hours per day.

Johannesburg.—Bright sunshine 285·5 hours.

Mauritius.—Mean. temp. of air 0°·2, of dew point 0°·6, and R 1·68 in. below averages. Mean hourly velocity of wind 10·4 miles or 0·4 miles above average.

KODAIKANAL.—Bright sunshine 90 hours ; TSS on 7 days.

COLOMBO.—Mean temp. of air 80°·9 or 0°·1 above, of dew point 0°·2 above, and R 5·09 in. above, averages. Mean hourly velocity of wind 8·4 miles. TSS on 7 days.

HONGKONG.—Mean temp. of air 81°·6. Bright sunshine 126·0 hours. Mean hourly velocity of wind 12·1 miles.

Sydney.—Mean temp. of air 0°·4 above, and R 2·45 in. below, averages.

Melbourne.—Mean temp. of air 0°·5 above, and R ·86 in. below, averages.

Perth—Mean temp. of air 0°·9 above, and R 2·52 in. below, averages.

Coolgardie.—Mean temp. of air 0°·7 above, and R ·96 in. below, averages.

Hobart.—Mean temp. of air 1°·1 above, and R ·60 in. above, averages.

Wellington.—Mean temp. of air 0°·5 below, and R 1·25 above, averages. Bright sunshine 77·4 hours.